Research Trends in Information Technology: A Bibliometrics Analysis of IEEE Indonesian Section Conferences

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Abstract. This study provides a comprehensive analysis of the Indonesian IEEE Section conferences in information technology, examining its structure, research trends, author collaboration, and citation patterns. By leveraging bibliometric techniques, we investigate the factors influencing the visibility and impact of research conducted within the Indonesian IEEE community. The study utilized a comprehensive dataset of scholarly publications from the top five Indonesian IEEE Section conferences held between 2020 and 2023. The data was extracted from the IEEE Xplore digital library, encompassing information on paper's unique characteristics and its contributions to the field. The collected data was analyzed using bibliometric techniques provided by Lens.org and Publish or Perish to uncover patterns in subject areas, authorship patterns, thematic areas, and citation impact covered by the proceedings. The result of this study provides valuable insights for researchers and policymakers seeking to comprehend the current state and future trajectory of information technology research within Indonesia.

Keywords: —IEEE Indonesia Section, scholarly publications, research trends, citation analysis, open access, author collaboration, bibliometric analysis

Introduction

The IEEE is organized into technical divisions known as societies, each focusing on a specific area of electrical engineering and computer science. To facilitate localized engagement, these societies form chapters within geographical regions. A chapter can represent one or more societies, allowing members to participate in multiple areas of interest while maintaining a local connection. This structure enables the IEEE to cater to diverse member interests and foster a strong sense of community at both global and regional levels.

The IEEE Indonesia Section was officially recognized on February 16, 1988, with its geographical boundaries approved by the IEEE's governing body for member regions. The section's primary objective is to support local IEEE members in their professional development and community engagement. As an integral part of the IEEE, the Indonesia Section adheres to the organization's core values, mission, and vision. However, to comply with Indonesian laws and regulations, the section has also established its own governing documents, known as the Articles of Association.

Previous IEEE Indonesia Section (IIS) conferences and seminars have attracted a large number of participants from both academia and industry, and have helped to promote the exchange of ideas and collaboration between researchers and practitioners. The graph depicts a marked increase in scholarly output by Indonesian

authors within the IEEE from 1959 to 2021. While both journal and proceedings publications grew significantly, proceedings experienced a more rapid surge, especially after 2010.

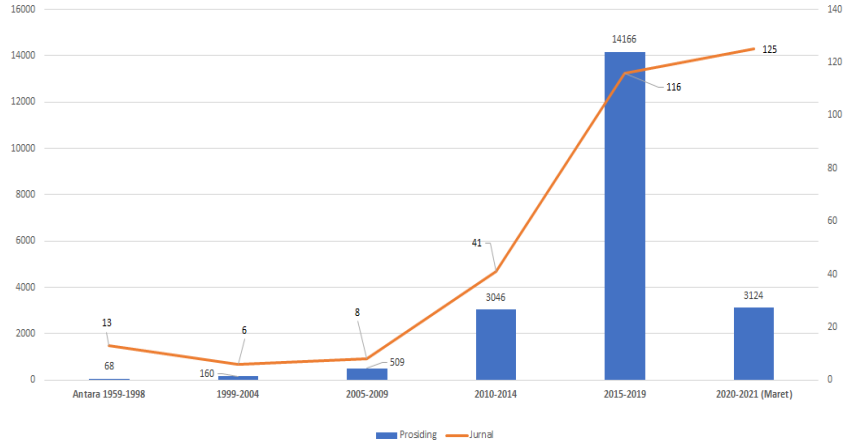

Figure 1. IEEE Publication Statistics 1959-2021 (https://ieee.id)

This trend suggests a pronounced shift in publication preference among Indonesian researchers towards conference-based dissemination. While the reasons for this trend require further exploration, it is clear that proceedings have become the primary mode of knowledge sharing for Indonesian authors within the IEEE ecosystem. The provided data underscores a significant transformation in publication patterns among Indonesian researchers affiliated with the IEEE.

A pronounced shift from journal articles to conference proceedings as the primary output format is evident (Merigó et al., 2018; Marzi et al., 2020). This trend, while indicative of a broader change in scholarly communication, warrants further exploration to fully comprehend its implications. Several factors may contribute to this phenomenon. The increasing emphasis on rapid knowledge dissemination, often prioritized in conference proceedings, could be a driving force. Additionally, the potential for immediate feedback and the networking opportunities offered by conferences might be particularly attractive to early-career researchers. Changes in academic evaluation systems, with greater weight placed on conference publications could also influence author behavior.

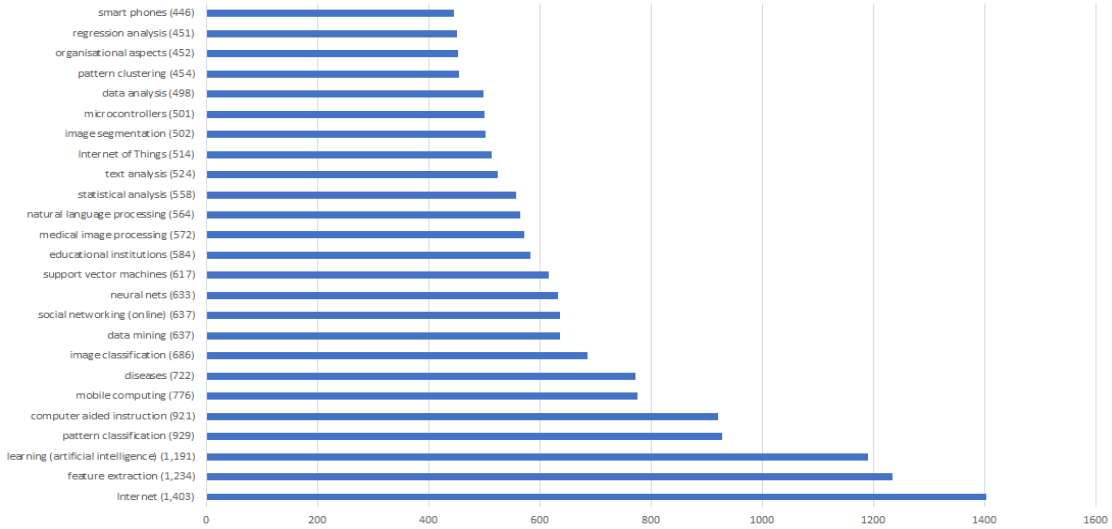

Figure 2. IEEE Topic of Publication in Indonesia 1988-2021 (https://ieee.id)

The presented bar chart provides a comprehensive overview of research thematic distribution among Indonesian authors contributing to IEEE conferences from 1988 to 2021. The visualization effectively delineates the relative frequency of various subject areas, offering insights into the trajectory of Indonesian research within this domain.

Artificial intelligence, encompassing subfields such as machine learning and neural networks, emerges as a dominant theme, signifying a pronounced emphasis on intelligent system development. Fundamental computer science domains, including data mining and image processing, also feature prominently, underscoring their foundational role in the discipline . Notably, the increasing incidence of internet-related topics reflects a growing convergence of information technology and research.

This analysis indicates an alignment between Indonesian research and global information technology advancements, particularly in the realms of artificial intelligence and data science. However, disparities in research focus, with an underrepresentation of areas such as cybersecurity and human-computer interaction, suggest potential avenues for future exploration.

To gain a more comprehensive understanding of this trend, this study delves into specific factors such as subject areas, authorship patterns, thematic areas, and citation impact. By examining these elements, researchers can identify the primary drivers of the shift towards conference publications and assess its impact on the overall quality and visibility (Merigó et al., 2018; Marzi et al., 2020) of Indonesian research output. Further, this study will provide a temporal analysis to fully comprehend the dynamics of Indonesian research within the IEEE ecosystem.

This research is centered on a corpus of IEEE conferences organized by the Indonesian Section within the past four-year period. These conferences were selected due to their explicit alignment with the field of information technology. The consistent focus on information technology topics within these conferences has yielded research outputs with high relevance to the discipline (Gómez Cano & Sánchez Castillo, 2024). Furthermore, the organizing institutions of these conferences are established entities renowned for their contributions to computer science research and development (Fu et al., 2024).

The remainder of the paper is structured as follows: Section II outlines the data and research methods employed in this study. Section III presents the findings, covering publication trends, author collaboration, citation analysis, research themes, and alignment with citation impact and disciplinary variations. The paper concludes with a discussion of study limitations in Section IV and a summary of key findings in Section IV.

Methodology

This study employs a multifaceted methodological approach, combining scientometrics, network analysis, and text mining techniques to investigate several key dimensions of the corpus. Specifically, the analysis delves into bibliometric patterns, authorship, the extent of citation analysis with research outputs, and the underlying thematic structure of the documents through a text analysis-based approach for analysis and mapping (Wulandari et al., 2023; Fu et al., 2024).

The methodology involved collecting data from the journal and analyzing it using bibliometric techniques. Bibliometrics is a set of methods used to study or measure texts and information. It can be used to trace relationships among academic journal citations (Gómez Cano & Sánchez Castillo, 2024; Fu et al., 2024).

Citation analysis is a commonly used bibliometric method that is used to compute the impact factor of a journal (Jing et al., 2024). These techniques are used to analyze the data and draw conclusions about the publishing patterns, authorship and collaboration structure, citation impact, funding patterns, and thematic structure of the IEEE proceedings.

Our analysis leveraged a variety of data points extracted from the collected documents, including access type, publication year, author names, subject area, source title, keywords, author affiliation, disciplinary breakdown, and citation analysis. Within this dataset, we employed a title-based search strategy to identify all documents pertaining to information technology research trends (Öztürk et al., 2024a; Donthu et al., 2021) at the IEEE Indonesia Section Conferences.

The stringency of the selection criteria can lead to a reduction in sample size, potentially affecting the statistical power of the analysis. The initial selection of IEEE conferences was conducted by exploring https://ieee.id as the official website of the IEEE Indonesia Section (IIS). From a pool of the top 20 most consistently held IIS conferences over the past four years, we selected the five that exhibited the strongest thematic alignment with information technology. This selection was based on a rigorous analysis of the conference topics and subtopics, ensuring that the chosen conferences were primarily focused on information technology-related research.

To ensure the relevance, quality, and representativeness of our data, we employed a two-step selection process. First, we identified the top 20 most consistently held Indonesian Information Systems (IIS) conferences over the past four years using Lens.org, a free and open tool to find, analyze, and manage patent and scholarly data. Lens.org provides a reliable foundation for identifying established and active scholarly metrics and research metadata. Second, we conducted a rigorous thematic analysis (Chen & Song, 2019) of these top conferences, selecting the five that exhibited the strongest alignment with information technology based on their topics and subtopics (Isenberg et al., 2017).

This two-step process minimized potential biases associated with conference selection and established a solid foundation for our analysis, ensuring our findings accurately reflect the current state of information technology research in Indonesia (Safitri et al., 2020). This rigorous selection process helps to minimize bias and establish a solid foundation for our bibliometrics analysis (Öztürk et al., 2024a; Hook et al., 2021), ensuring that our findings accurately reflect the current state of information technology researchin Indonesia.

The bibliometric indicator used in this research is adopted from (Merigó et al., 2018),which involves a detailed bibliometric analysis of the selected IIS conferences. It involves publishing patterns, authorship and collaboration structure, citation impact, and the thematic structure of the publication.

- ToP represents the total number of publications associated with the journal within the dimensions database.
- ToC denotes the cumulative number of citations received by all publications from the conference paper. The annual citation count for each year is also recorded.
- ToC/ToPisa ratio indicating the average number of citations per publication.
- The h-index, g-index, and ha-index measure the journal's productivity and citation impact, representing the number of papers cited at least h times.
- ToC/Year calculates the total citations received within a specific year.

While previous analyses focused on publication quantity, this study delves into the quality and impact of research output using citation metrics. By employing the Publishor Perish (PoP) software, we conducted a comprehensive analysis of h-index and g-index for the selected conferences. These metrics offer valuable insights into the influence and quality of research within the field (Öztürk et al., 2024a; Donthu et al., 2021).

Result and Discussion

A comprehensive analysis was conducted on the collected data to reveal patterns and trends across various aspects, including subject areas, authorship patterns, thematic areas, and citation impact. Most findings were presented as frequencies and percentages to illustrate their relative prevalence of information technology-related topics in the last four years. Total number of publications (ToP) : 1.833 conference papers were analyzed from the top five IIS conferences from 2020 to 2023. For annual publication growth, a more detailed approach was employed, presenting the number of retrieved documents per year along with their frequency, percentage, and cumulative percentage (Figure 3). This approach provides a clearer picture of publication trends over time.

The analysis of the provided data reveals several key findings regarding the research landscape within the IEEE Indonesia Section conferences. First, the dominant subject areas of conference papers in 2020 and 2023. It underscores the interdisciplinary nature of computer science research, with strong connections to engineering, science, and business disciplines. The study identifies emerging technologies, including artificial intelligence, internet-related topics, and data-driven approaches, as prominent areas of focus in the region.

Second, the dynamics of author collaboration and research trends within the IIS community. The analysis reveals a predominantly individualistic research landscape, with two-author to six-author collaborations accounting for the majority of publications. Third, the growing representation of these emerging technologies suggests Indonesia's alignment in information technology with global technological advancements. Finally, the importance of citation metrics and access types towards IIS conference papers.

The quantitative analysis of publication data reveals a clear disparity in research output among the top five IIS conferences. The data presented provides a quantitative analysis of total publications across five conferences (ICITEE, ISRITI, ITIS, ICITACEE, and ICIMTech) from 2020 to 2023. ICIMTech consistently maintains the highest number of publications, indicating a significantly higher level of research output or publication activity compared to other conferences. While ICIMTech demonstrates a relatively stable publication count, other conferences exhibit fluctuations, with ISRITI and ICITEE showing a decrease in publications from 2021 to 2022, followed by an increase in 2023. ITIS and ICITACEE demonstrate a more consistent upward trend.

Table 1: Total Publication

Conference Name	*2020*	*2021*	*2022*	*2023*	*Sub Total*
International Conference on Information Technology and Electrical Engineering (ICITEE)	68	45	56	70	239
International Seminar on Research of Information Technology and Intelligent Systems (ISRITI)	134	115	142	94	485
Information Technology International Seminar (ITIS)	56	43	69	85	253
International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE)	56	50	60	78	244
International Conference on Information Management and Technology (ICIMTech)	178	158	147	129	612
TOTAL PUBLICATION (ToP)					**1.833**

This analysis offers a preliminary overview of publication trends across the five conferences. ICIMTech emerges as the leading conference in terms of publication output, while other conferences exhibit varying levels of productivity. Further analysis, including information about publication quality, impact factors, and author contributions, is necessary to provide a more comprehensive understanding of conference performance (Hirsch, 2005).

Figure 3 presents a longitudinal analysis of five entities—ITIS, ICIMTech, ICITEE, ICITACEE, and ISRITI—spanning the period from 2020 to 2023. ICIMTech consistently occupies the apex of the dataset, indicating superior performance relative to its counterparts across the examined time frame. ISRITI and ICITEE exhibit a predominantly upward trajectory, with ISRITI demonstrating a more pronounced ascent. This suggests a more substantial growth rate for ISRITI compared to ICITEE. In contrast, ITIS and ICITACEE display a fluctuating pattern, indicative of relatively stable performance with minor deviations.

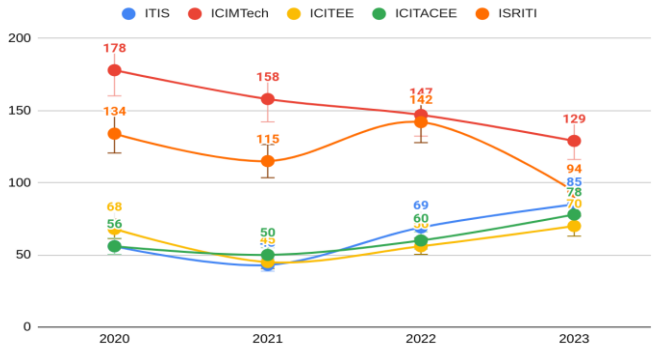

Figure 3. IEEE Publication Count from 5 Conferences

ICIMTech emerges as the dominant conference, followed by ISRITI. The remaining three entities exhibit comparable shares. ICIMTech constitutes the largest number of papers, comprising 33.4% (612) of the total papers, signifying its dominant position among the entities. ISRITI follows as the second most prominent

category, with a share of 26.5% (485), indicating a substantial presence. The remaining entities, ITIS, ICITACEE, and ICITEE, exhibit relatively equal proportions, ranging from 13.0% to 13.8%, suggesting a more balanced distribution within the group.

A. Subject Area

The data analysis utilizes the 2020-2023 IIS conference subject areas and spatial arrangement to highlight the relative importance and interconnections of concepts within the field of computer science. Through this strategic approach, the visualization subject area generated from Lens.org facilitates the identification of key themes and their underlying relationships. While the core principles of computer science remain essential, the field has expanded to encompass a broader range of disciplines. The IIS subject underscores the interdisciplinary nature of computer science, with strong connections to engineering, science, and business. This integration is driving innovation and addressing complex challenges across various domains.

Artificial intelligence and machine learning have emerged as focal points, as evidenced by the clustering of related terms. This reflects a growing interest in developing intelligent systems capable of learning from data and making autonomous decisions. The prominence of emerging technologies, such as the internet, social media, and data analytics, highlights the transformative impact of digital technologies on society. These technologies are reshaping industries and creating new opportunities for computer science research(Safitri et al., 2021).

Through the strategic manipulation of word size and spatial arrangement, the visualization facilitates the identification of relative concept salience (Haq & Bahit, 2021) and semantic relationships (Donthu et al., 2021). The visualization subject area generated from the data analysis reveals a strong emphasis on the foundational principles of computer science. Terms such as "algorithm," "data structures," "programming," and "software engineering" form the core of the discipline, underscoring the importance of understanding these fundamental concepts.

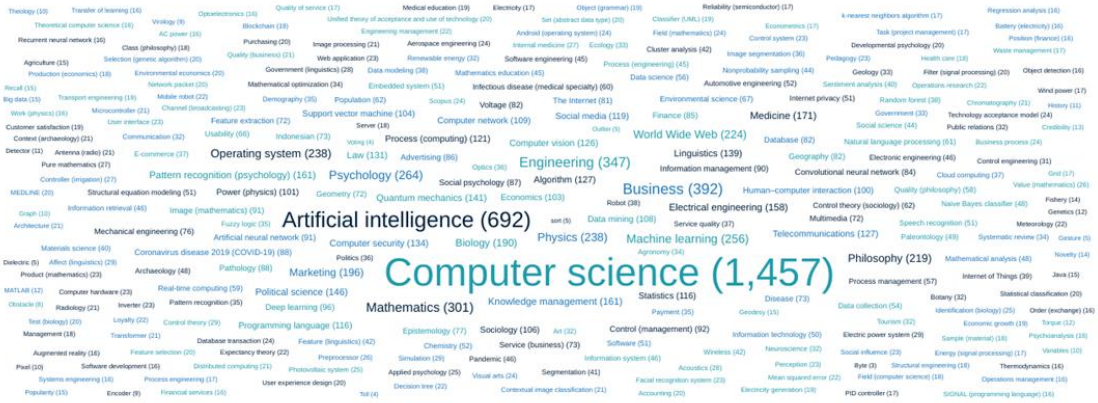

Figure 4. Subject Area Covered in Conference Proceedings

Theoretical foundations, including mathematics, statistics, and logic, remain essential components of computer science research. These disciplines provide the theoretical underpinnings for developing algorithms, analyzing data, and reasoning about complex systems. The statement aligns with the findings of previous research on the importance of theoretical foundations in computer science.

For instance, studies conducted by (Mayasari et al., 2024; Chigarev, 2022; Apiola et al., 2022) have emphasized the role of mathematics, statistics, and logic in developing algorithms, analyzing data, and reasoning about complex systems. These theoretical underpinnings provide a solid foundation for computer science research, enabling the development of innovative solutions to various challenges.

The strong association between computer science and engineering disciplines, such as electrical engineering, mechanical engineering, and civil engineering, underscores the practical applications of computer science in various engineering fields. This finding aligns with previous research by (Ahmi et al., 2019), which have

highlighted the synergistic relationship between these disciplines and the potential for cross-disciplinary collaboration (Fiala & Tutoky, 2017).
The presence of terms related to physics, biology, chemistry, and psychology highlights the interdisciplinary nature of computer science research. This suggests that computer science is increasingly applied to address complex problems in diverse scientific domains (Fu et al., 2024; Ali et al., 2024). Additionally, the inclusion of terms like "business," "economics," and "finance" emphasize the practical applications of computer science in commercial and economic contexts (Haq & Bahit, 2021). This demonstrates the growing importance of computer science in driving innovation and efficiency in various industries.

The visualization also highlights the prominence of emerging technologies within the field of computer science. Terms such as "internet," "world wide web," "social media," and "cybersecurity" underscore the significant impact of digital technologies on society. The growing importance of data-driven approaches is evident in the cluster of terms related to data mining, big data (Zhang et al., 2021), and data analytics (El-Alfy & Mohammed, 2020). These emerging technologies are reshaping various industries and driving innovation in computer science research (Ahmi et al., 2019).

B. Authorship Patterns

Authorship patterns in bibliometric analysis examine how researchers collaborate, contribute, and receive recognition within scholarly publications. By analyzing authorship patterns, researchers can gain valuable insights into the dynamics of research collaboration (Hirsch, 2005), the distribution of authorship roles (Donthu et al., 2021), and the factors influencing research productivity and visibility (Jing et al., 2024; Perez Calderón & Alrahamneh, 2024). Figure 5 presented below is a representation of author productivity, ranking individuals based on their number of cited publications. High Productivity Cluster : A subset of authors, comprising Erwin Halim (28), Bens Pardamean (24), and Ridho Bramulya (23), demonstrate markedly elevated publication output relative to their peers, indicative of heightened research or writing productivity.

While larger collaborations occur, they are less frequent, suggesting that individual research efforts remain a significant force in the field. A small subset of authors contributes disproportionately to the overall research output, highlighting the concentration of research efforts among a select group of individuals.

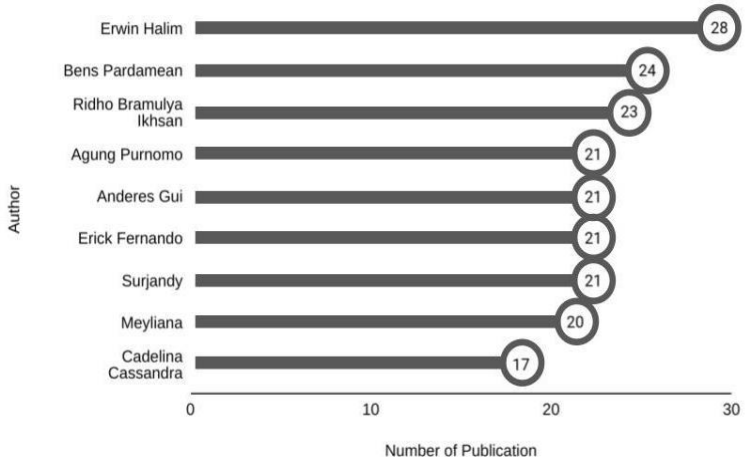

Figure 5. Most Active IIS Contributors.

Figure 6 presents a comprehensive analysis of author collaboration patterns within a dataset of scholarly publications. The data includes information on the number of authors involved in each publication and the total number of publications for each author count. The majority of publications are authored by either a single author (16.9%) or two authors (18.7%). This suggests a significant proportion of individual research efforts and small-scale collaborations (Apiola et al., 2022).

As the number of authors increases, the frequency of publications declines. This trend indicates that while larger collaborations do occur, they are less common compared to two-author to six-author publications. A small percentage of authors contribute a disproportionate number of publications. Papers with seven to ten authors were counted for 57 conference papers. For example, 3 authors account for 30.5% (559 papers) of all publications, four-authors account for 18.7% (342 papers), 16.9% of papers (310) published by two-authors, 258 papers by six-authors, and five-authors in 240 papers. These patterns highlighting the concentration of research output among a select group of authors (Ali et al., 2024).

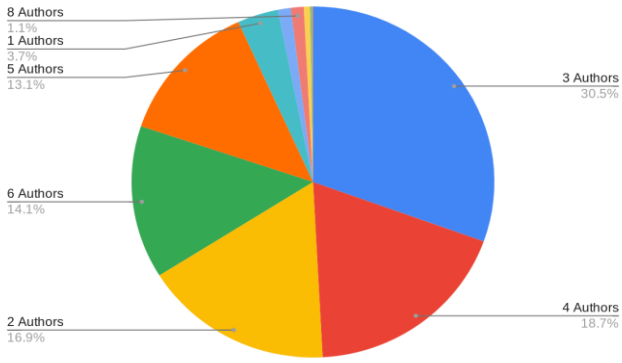

Figure 6. IIS Author Pattern per Paper.

The analysis reveals a predominantly individualistic research landscape, with two-author to six-author publications of IIS conferences dominating the conference publications with a total of 1.709 papers. While larger collaborations do occur, they are less frequent. This suggests that while collaboration can be beneficial, individual research efforts remain a significant force in the field (Mayasari et al., 2024) (Hirsch, 2005). Indeed, the provided data offers a valuable perspective on author collaboration patterns within the dataset.

C. Thematic Areas

The provided data in Table II offers a comprehensive overview of the research themes prevalent in five prominent IIS conferences: ICITEE, ISRITI, ITIS, ICITACEE, and ICIMTech. By analyzing the distribution of topics across these conferences, we can gain valuable insights into the research landscape in Indonesia and identify emerging trends.

Table 2: Conference Theme

Conference Name	*2020 - 2023*
ICITEE	Signal Processing & Analysis; Power, Energy, & Industry Applications; Computing & Processing (Hardware/Software); Robotics & Control Systems; Components, Circuits, Devices & Systems; Communication, Networking & Broadcasting.
ISRITI	Robotics & Control Systems; Computing & Processing (Hardware/Software); Signal Processing & Analysis; Communication, Networking & Broadcasting; Artificial Intelligence, Data Science
ITIS	Computing & Processing (Hardware/Software); Transportation; Signal Processing & Analysis; Robotics & Control Systems; Power, Energy, & Industry Applications; General Topics for Engineers (Math, Science & Engineering); Components, Circuits, Devices & Systems.
ICITACEE	Power, Energy, & Industry Applications; Fields, Waves & Electromagnetics; Signal Processing & Analysis; Robotics & Control Systems; Engineered Materials, Dielectrics & Plasmas; Computing & Processing (Hardware/Software); Components, Circuits, Devices & Systems; Communication, Networking & Broadcasting.
ICIMTech	Computing & Processing (Hardware/Software)

While these themes are shared across multiple conferences, there are also notable variations. For instance, ICITACEE places a particular emphasis on fields, waves, and electromagnetics, while ISRITI demonstrates a strong focus on artificial intelligence and data science (Iqbal et al., 2019). The increasing representation of artificial intelligence, data science, and internet-related topics across the conferences suggests emerging trends in Indonesian research. These areas align with global technological advancements (Chigarev, 2022; Ahmi et al., 2019; Mutanga et al., 2023) and reflect a growing interest in developing intelligent systems and harnessing the potential of digital technologies (Suprapto et al., 2021).

The analysis reveals a diverse research landscape within the Indonesian IEEE community, with a strong emphasis on core computer science topics and emerging trends in artificial intelligence and data science. The identification of common themes and variations across conferences provides valuable insights for researchers and policymakers seeking to understand the direction of Indonesian research and identify potential areas for collaboration and development.

D. Citation Impact

Several metrics are employed to assess the citation impact of the IIS conference papers in this study, including the total number of citations, average citations per year, h-index, g-index, and ha-index. These metrics offer diverse perspectives on a publication's influence (Sidiropoulos et al., 2006), considering factors such as the number of citations, the quality of citing works (Fassin, 2023), and the overall productivity of the author or research group (Öztürk et al., 2024a).

Table 3: Total Citation

Conference Name	*2020*	*2021*	*2022*	*2023*	*Sub Total*
ICITEE	187	58	53	9	307
ISRITI	427	162	116	2	707
ITIS	129	32	51	5	217
ICITACEE	224	82	68	20	394
ICIMTech	579	274	99	22	974
TOTAL CITATION (ToC)					**2.599**

Table III shows a quantitative overview of citation performance for each conference over time. Toral 2.599 citations accounted for all conference papers in a four-year period. ICIMTech emerges as the leading conference in terms of citation count (974), but all conferences exhibit a declining trend. The provided data reveals a concerning trend of declining citations for all five Indonesian conferences analyzed. The significant decline in citations for ICITEE, ISRITI, and ICITACEE suggests a potential shift in research focus or increased competition from other conferences. This is supported by the observation that these conferences experienced a decrease in the number of publications, particularly in 2021 and 2022, which may indicate a reallocation of research efforts. Additionally, the emergence of new conferences or the growing prominence of other research outlets could contribute to the decline in citations for these Indonesian conferences.

The discussion highlights the importance of considering both citation metrics and access types when evaluating research impact. ICIMTech consistently outperforms other conferences in terms of citation count, indicating a higher level of research impact. The provided heatmap (Figure 7) depicts a visual representation of authorship citation patterns among a group of top 20 IIS contributors. The color intensity of each cell indicates the citation count, with darker shades representing higher citation levels.

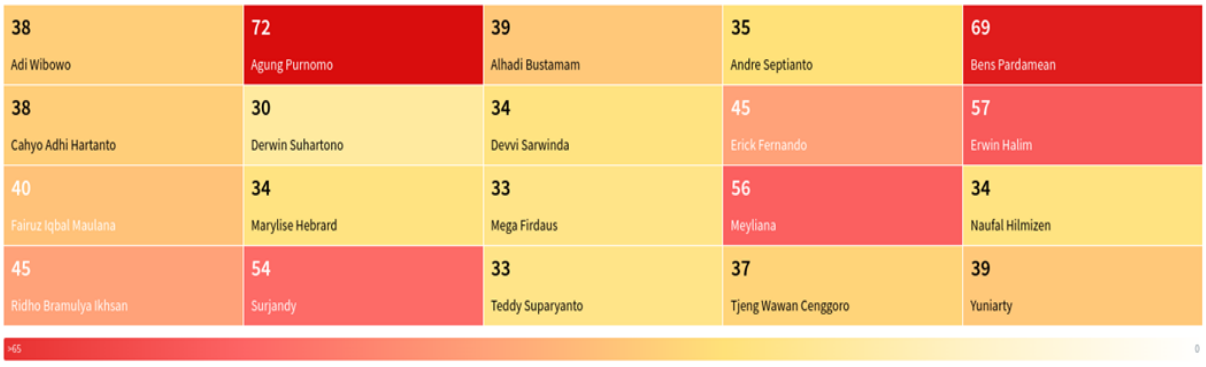

Figure 7. Top 20 Authors Citation Count

Agung Purnomo and Bens Pardamean (72 and 69, respectively) emerge as the most cited authors, with a significantly higher number of citations compared to their peers. Certain authors appear to be clustered together, suggesting potential collaboration or research focus alignment. For example, Adi Wibowo, Cahyo Adhi Hartanto, and Erwin Halim exhibit similar citation patterns. While clusters exist, there are also variations within each group. For instance, within the cluster of Erwin Halim (57), Meyliana (56), and Surjandy (54), although Erwin Halim has a notably higher publication count (28 papers).

Table 4: Conference Almetrics Index

Conferences	*h-index*	*g-index*	*cite/year*	*h_a-index*
ICITEE	7	8	76.75	4
ISRITI	10	12	176.75	4
ITIS	6	8	54.25	3
ICITACEE	8	13	98.5	4
ICIMTech	12	14	243.5	4

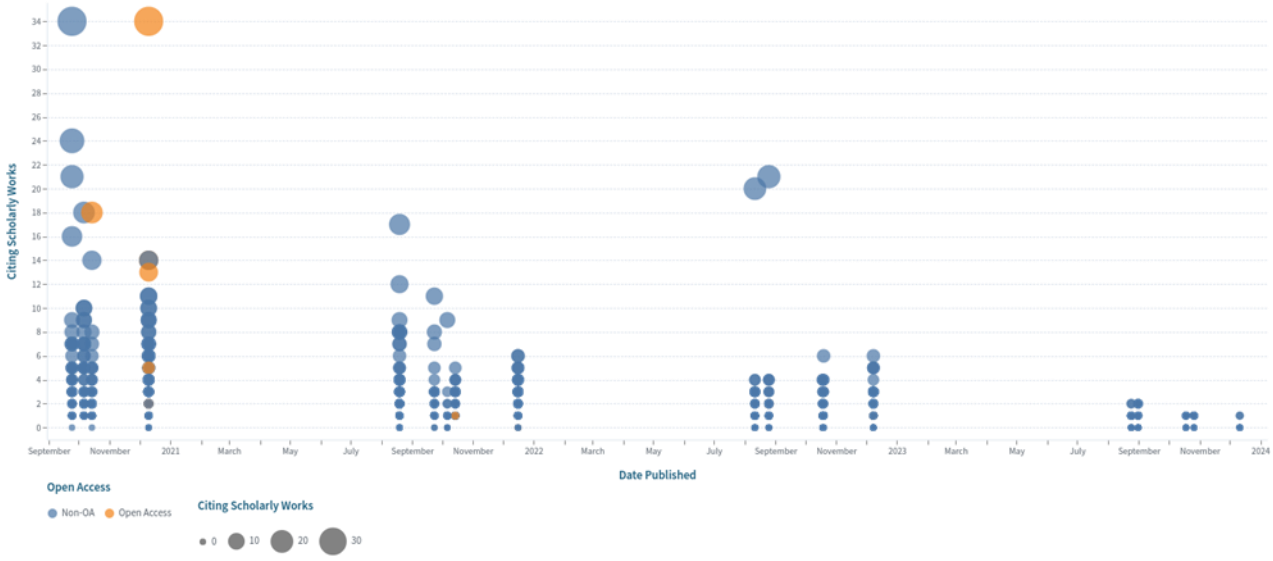

Figure 8. OA vs Non-OA Citation Diagram

The ToP has fluctuated over the years, with a slight decrease in 2021 (411), compared to 2020 (492). However, it has increased since then, reaching 474 in 2022 and 456 in 2023. Overall, there have been 1,833 publications in the four years. On the other hand, there is a significant decline in ToC from 2020 (1,546) to 2023 (58). This suggests that the publications are being cited less over time. The ratio of ToP to ToC provides insights into the average number of citations per publication. This ratio has increased significantly over the years, from 0.32 in 2020 to 7.86 in 2023.

The increasing ToP/ToC ratio suggests that the average number of citations per publication is rising. However, the simultaneous decline in the overall number of citations indicates that the total research output may be decreasing, or that the quality or impact of the research being published may be declining. This could be due to various factors, such as a shift in research focus (Alagheband et al., 2020), increased competition from other conferences, or changes in citation practices (Apiola et al., 2022).

Table 5: The Almetrics of IIS Publication

Indicators	*2020*	*2021*	*2022*	*2023*	*TOTAL*
Total Publications (ToP)	492	411	474	456	1.833
Total Citation (ToC)	1.546	608	387	58	2.599
ToP/ToC	0.32	0.68	1.22	7.86	0.71

Indicators	*2020*	*2021*	*2022*	*2023*	*TOTAL*
ToC/Year	32.3	50.7	32.3	4.8	216.6

This metric shows the average number of citations per year. Similar to the ToP/ToC ratio, the ToC/Year ratio has also increased over the years, from 32.3 in 2020 to 50.7 in 2021. However, it has decreased significantly in 2023 (4.8). There might be a lag between the publication of a research paper and when it starts to be cited by other researchers. This could explain why the number of citations is decreasing even though the ToP/ToC ratio is increasing.
The discrepancy between the number of publications and the number of citations received by authors highlights the complexity of measuring research impact (Marzi et al., 2020). While a high publication count may suggest productivity, it does not necessarily correlate with the quality or influence of the research. Citation analysis provides a more nuanced understanding of a researcher's impact by considering the extent to which their work is cited by others (Öztürk et al., 2024b) in the field. However, it is important to consider further analysis when interpreting citation data and avoid relying solely on publication count as a measure of research impact (Sidiropoulos et al., 2006) among the individual author.

ICIMTech consistently outperforms the others, demonstrating superior research quality and impact. Specifically, these conferences exhibit higher h-index and g-index values, indicating a larger number of highly cited publications and a broader overall impact. Although ICITEE and ISRITI lead in terms of average citations per year, ICITACEE and ICIMTech's strong performance across multiple metrics underscores their consistent quality and influence. These findings highlight the importance of considering various citation metrics for a comprehensive understanding of conference impact (Santoso et al., 2023).

Our further analysis highlights a significant disparity in citation patterns between Open Access (OA) and non-Open Access (non-OA) publications. Figure 9 visualizes a comparative analysis of citation patterns between OA and non-OA publications across the 2020-2023 period. The data is visualized using a scatter plot with individual data points representing specific works, and the color differentiation between blue and orange signifies the access type.

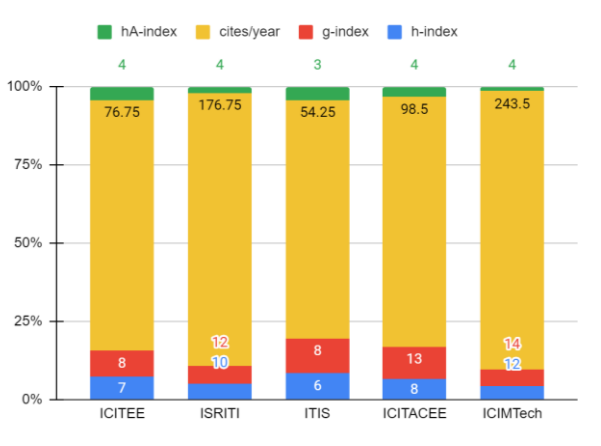

Figure 9. Conference citation per year, h-index, g-index, and ha-index

The analysis reveals a clear disparity in citation metrics among the five IIS conferences (Figure 9). ICITACEE and ICIMTech consistently outperform the others, demonstrating superior research quality and impact. Specifically, these conferences exhibit higher h-index and g-index values, indicating a larger number of highly cited publications and a broader overall impact. Although ICITEE and ISRITI lead in terms of average citations per year, ICITACEE and ICIMTech's strong performance across multiple metrics underscores their consistent quality and influence.

A pronounced disparity is evident in citation counts, with non-OA publications consistently garnering significantly more citations than OA publications across the four-year period. This discrepancy is particularly acute during the 2020 and 2021 years. While non-OA citations remain dominant, there is a noticeable increase in OA citations from 2020 to 2023. This suggests a growing trend towards open access publishing and subsequent citation. The data presented offers a preliminary overview but would benefit from additional

context (Chen & Song, 2019), such as the total number of publications in each category, to enable a more comprehensive analysis of citation impact.

While both OA and non-OA categories exhibit significant heterogeneity in citation counts, as evidenced by the dispersion of data points along the y-axis, this reveals a consistent temporal pattern characterized by a surge in citations during the latter half of each year, suggestive of annual reporting or evaluation cycles. A small subset of data points with exceptionally high citation counts emerges as potential outliers, warranting further investigation.

Limitation of The Study

As with any research endeavor, this study is not without its limitations. The analysis tool used, Lens, a relatively new research tool, has been undergoing significant improvements. Primarily known for its focus on patents, it has been expanding its capabilities to include scholarly metrics. Furthermore, the h-index, g-index, and ha-index while useful, can be misleading without considering the specific context of a researcher's field. It may favor established researchers over those in the early stages of their careers or those who have experienced career breaks. Additionally, the h-index may not accurately reflect differences in citation patterns across various disciplines.

Despite its adequacy for the initial analysis, the scope of the dataset could be expanded to provide a more comprehensive understanding of the research landscape. A larger dataset would enable more representative analysis, allowing for the identification of emerging trends with greater certainty. Furthermore, expanding the dataset would facilitate a more detailed examination of author collaboration patterns, citation dynamics, and the evolution of research themes over time.

The analysis of research trends relies on databases like Lens.org, but their accuracy can be impacted. Uploading large numbers of unreviewed articles through preprint servers can inflate data volume, while the inclusion of non-scholarly content like "list of reviewers" entries can further skew results. Similarly, Altmetrics' Attention score, a measure of social media engagement, doesn't necessarily reflect research quality, highlighting the limitations of public interest as a sole indicator of academic merit. These factors necessitate careful consideration when interpreting research trends based on such data sources.

Conclusion

As the IIS conference continues to evolve, it will undoubtedly play a crucial role in shaping the future of information technology research, especially in Indonesia. This rapid growth in publication volume can be attributed in part to its distinctive characteristic. As a consequence, highly respected researchers have increasingly chosen to submit their work to conference proceedings. Furthermore, citation metrics indicate a concurrent rise in the impact of published research. Ultimately, while the predominance of conference publications among Indonesian IEEE authors is a notable development, a nuanced understanding of the underlying factors is essential to inform strategies for optimizing research impact and visibility.

The provided data highlights a valuable perspective on the research themes prevalent in IIS conferences in the last four years. The analysis highlights the dominance of core computer science topics and the emergence of artificial intelligence and data science as key areas of focus. The analysis reveals a dynamic research landscape within the Indonesian IEEE community, characterized by a growing focus on artificial intelligence, data science, and emerging technologies. These trends align with global technological advancements and reflect the increasing importance of computer science in addressing complex challenges. Understanding these trends can inform research strategies and policy decisions to support the growth and development of the Indonesian research landscape.

The study provides valuable insights into the research landscape within the IIS research community. Future research could explore additional datasets and address the identified limitations to enhance the comprehensiveness of the analysis. Additionally, analyzing the impact of collaboration on publication quality

and evaluating the long-term consequences for the open access paradigm can provide further insights into the benefits and challenges associated with collaborative research. Further research should delve into the factors influencing citation matrices and explore strategies to enhance research visibility and impact within the Indonesian IEEE Section community. This will contribute to a more comprehensive understanding of the dynamics of research dissemination and influence within the field.

Moreover, a more in-depth analysis of keyword co-occurrence networks within both subject areas and author co-citation patterns is essential to comprehensively understand the significance and interconnections between specific research areas and the authors contributing to them. By examining the co-occurrence of keywords and authors, researchers can gain valuable insights into emerging research trends, disciplinary collaborations, and the potential for interdisciplinary research.

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